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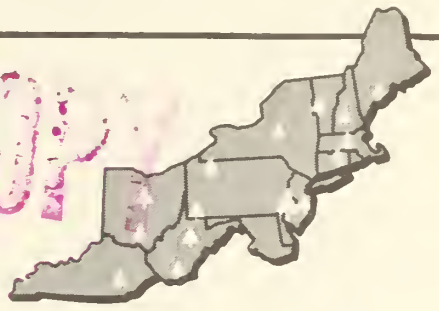

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ROOTING COMMON AND CAT GREENBRIER

Abstract.—Because reliable methods for propagating greenbriers are needed for wildlife-habitat purposes, we tested stem and rhizome cuttings of common and cat greenbrier and tubers of the latter species. Common greenbrier is the better species for most wildlife habitat uses. It proved fairly easy to propagate from either stem or rhizome cuttings. Similar cuttings from cat greenbrier failed, but tubers rooted well and can be collected at moderate cost. We comment on the kinds of cuttings to collect, when to collect them, nursery procedures, and relative costs.

Common and cat greenbrier (*Smilax rotundifolia* L. and S. *glauca* Walt.) are among the native vines most valuable for wildlife in much of the southern and eastern United States. Greenbriers provide food and cover for grouse, turkey, pheasant, quail, wood duck, rabbit, deer, bear, opposum, raccoon, gray fox, and many songbirds (*Bailey and Rinell 1968, Blair 1936, Gilfillan and Bezdek 1944, Goodrum 1961, McAtee 1936, Martin et al. 1951, Nelson et al. 1938*). Greenbriers are highly nutritious; they produce fruit nearly every year, and the fruit often hangs on the vine until spring. Because greenbriers are aggressive and adapt well to poor sites, they could be grown on sites such as strip-mine spoils, cut banks, and old fields to improve wildlife habitat.

Little propagation research has been conducted. Sheat (*1953*) recommended lifting and dividing stock plants in the spring. Goodrum (*1961*) and Everett (*1967*) stated that greenbriers can be grown by division of the rhizomes in spring, but that canes may not appear until the second year after planting. Halls and Alcaniz (*1965*) tested stem cuttings under mist in a greenhouse and obtained 55 percent rooting from common greenbrier and 1 percent from cat greenbrier, after 13 weeks.

Materials and Methods

Greenbrier cuttings were collected at several locations near Morgantown, West Virginia. To compare differences among growth stages, stems of both species were collected in April (dormant), June (fast growth), and September (hardened off). In May and October, rhizomes of both species and tubers of cat greenbrier were collected—common greenbrier does not produce tubers. All samples were from vigorous plants growing in full or nearly-full sunlight.

To diversify the samples, only one or two stems or rhizomes were taken from a plant; and only one to three cuttings were made from

a stem or rhizome. Because greenbriers root mostly at the nodes, each cutting was made long enough to include three to five healthy nodes, each with a live bud. Lengths ranged from 2.5 to 13 inches; and many were longer than was necessary.

Stem cuttings were of two kinds, which we called juvenile and mature. Juvenile cuttings were taken from main stems only and were of the preceding year's growth (April) or current growth (June and September). Mature cuttings were taken from older growth on a main stem or from any portion of a lateral stem.

Rhizome cuttings were taken from all parts of the rhizomes except from the distal ends. These cuttings were of two kinds: without and with sprouts. Sprouts were pruned back, if necessary, so that each one had only three to five nodes. Few of the rhizomes with sprouts had more than one sprout.

Each collection was mixed; and samples of 25 stem cuttings, 20 rhizome cuttings, and 20 tubers were drawn. All leaves but one or two were removed from each stem cutting or sprout. Each sample then was used as 1 of 4 replicates among 49 treatments.

For the stem cuttings, all 20 treatments of common greenbrier are shown in table 2. Indolebutyric acid (IBA) mixed in talc was applied to bases of the stem cuttings, except for two samples collected in September. The 18 treatments of cat greenbrier were practically the same, but none worked. The 11 treatments of rhizomes of both species and tubers of cat greenbrier are shown in table 3.

Planting depth for all cuttings was about 2 inches. Stem cuttings were planted upright, with one to three nodes below the surface of the medium. Rhizomes were planted horizontally, and all nodes (three to five) were within the medium. In rhizomes with sprouts, nearly all the upright sprouts had at least one node within the medium.

The rooting medium was sphagnum peat and perlite 1:1, plus a complete fertilizer at the rate of 22 ounces per 1/10 cubic yard. (Dolomitic limestone 16 oz., 46 percent superphosphate 1.5 oz., Ca $(NO_3)_2$ 2.5 oz., $MgSO_4$ 1.5 oz., iron chelate 1 tablespoon, and fritted trace elements 1 tablespoon.) Because this fertilizer leached quickly, we later added a slow-release feritlizer that lasted 3 to 4 months (Osmocote 14-14-14 at 8 pounds/100 square feet.) (Mention of a brand name is given for identification only and is not to be considered as an endorsement by the USDA Forest Service.) Our reason for fertilizing was to simulate treatment of the cuttings as if they were part of a hydroseeding mix.

Table 1.—Costs of greenbrier propagation treatments

Cutting	Month collected	Labor for collecting and planting		Greenhouse equipment, supplies, operation	Total per treatment
		Hours	*Dollars*	*Dollars*	*Dollars*
		COMMON GREENBRIER			
Stem[1]	Apr	4.7	7.08	20.21	27.29
Stem[1]	Jun	5.1	7.71	21.65	29.36
Stem, juvenile	Sep	5.3	7.96	25.49	33.45
Stem, mature	Sep	5.8	8.71	25.49	34.20
Rhizome[1]	May	5.6	8.46	20.53	28.99
Rhizome w/sprout	Oct	9.4	14.08	25.81	39.89
Rhizome w/o sprout	Oct	6.9	10.33	25.81	36.14
		CAT GREENBRIER			
Rhizome[1]	May	8.9	13.32	20.53	33.85
Rhizome w/sprout	Oct	10.9	16.32	25.81	42.13
Rhizome w/o sprout	Oct	7.4	11.08	25.81	36.89
Tuber	May	8.9	13.32	20.53	33.85
Tuber	Oct	5.4	8.08	25.81	33.89
Tuber, stored 41°F	Oct	5.4	8.08	22.74	30.82

[1]Two kinds were collected, but their costs were not recorded separately.

Table 2.—Common greenbrier stem cuttings (100 per treatment) after 6 months under mist in a greenhouse

Cutting[1]	IBA concentration in talc	Alive	Rooted	Sprouted		Rootlets/ rooted cutting
				Within medium	Above medium	
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Ave. No.*
Dormant (April):	0.1	76	56	54	0	82
Stem, juvenile	.3	92	60	57	3	92
	.8	95	67	66	4	59
Stem, mature	.1	88	59	54	2	59
	.3	89	64	59	3	66
	.8	80	72	71	2	74
All stems	—	87	63	60	2	—
Growing (June):	0.1	4	4	3	0	—
Stem, juvenile	.3	2	2	1	0	—
	.8	6	6	4	0	—
Stem, mature	.1	1	1	1	0	—
	.3	1	1	0	0	—
	.8	2	2	1	0	—
All stems	—	3	3	2	0	—
Hardened (Sep):	0.0	36	22	12	0	10
Stem, juvenile	.1	80	65	49	1	13
	.3	54	38	28	0	9
	.8	56	46	25	0	9
Stem, mature	.0	71	54	30	0	12
	.1	66	45	35	0	7
	.3	60	52	25	0	12
	.8	68	59	33	0	6
All stems	—	61	48	30	0	—

[1]Juvenile cuttings were from main stems only and from the preceding year's growth in April cuttings or current-season growth in June and September cuttings. Mature cuttings were from older growth on main stems or from any portion of lateral stems.

Table 3.—Greenbrier rhizomes and tubers (80 per treatment) after 6 months under mist in a greenhouse

Cutting	Month collected	Alive	Rooted	Sprouted		Rootlets per rooted cutting
				Within medium	Above medium	
		Pct.	*Pct.*	*Pct.*	*Pct.*	*Ave. No.*
		COMMON GREENBRIER				
Rhizome w/sprout	May	75	74	62	51	146
	Oct	95	86	55	1	39
Rhizome w/o sprout	May	44	40	44	0	52
	Oct	88	42	65	0	9
		CAT GREENBRIER				
Rhizome w/sprout	May	34	31	24	4	245
	Oct	51	26	6	0	10
Rhizome w/o sprout	May	15	15	12	0	142
	Oct	71	12	39	0	2
Tuber, fresh	May	99	69	68	0	238
	Oct	100	50	61	0	21
Tuber, stored[1]	Oct	90	30	35	18	249

[1]Stored for 3 months at 41°F before planting.

Cuttings and tubers were planted in flats; and the flats were kept in a small gothic-type greenhouse similar to the one developed by Marshall et al. (*1966*). The highest daytime temperatures were 70 to 95°F, and the nighttime lows were 60 to 65°F. From 7 a.m. to 9 p.m. the flats were kept moist by automatic, intermittent mist sprayed for 6 seconds at 6-minute intervals.

After 6 months in the greenhouse, cuttings and tubers were examined for survival, rooting, number and length of roots, rootlets, sprouts, and number of new tubers.

Work time and other costs were recorded or estimated for each set of activities so that efficiencies of the treatments could be compared. The following expenses were prorated among treatments: labor $1.50/hour, flats $27.90, mist system $90.40, refrigeration $0.15/month, greenhouse cost $1.32/square foot/year (*Bartok 1971*), greenhouse operation $0.06 to $0.10/square foot/week (*Ball 1972*), and miscellaneous equipment and supplies $55.58. From these amounts, we estimated the relative costs per treatment (table 1). Our costs were higher than they would be in larger-scale production, but differences among them are repesentative of the different treatments.

Results

Common greenbrier responded better than cat greenbrier to each treatment applied to both species. This species difference confirms findings by Halls and Alcaniz (*1965*) and holds for seed germination as well. Cat greenbrier seems better adapted to propagation from tubers, which common greenbrier lacks, than from any of the other vegetative or seed methods.

Common Greenbrier.—Among stem cuttings, those collected in April from dormant stems and rolled in an 0.8-percent IBA mixture (talc) did best. About 70 percent of them rooted, and nearly all rooting took place at the base of a sprout that formed within the rooting medium. The number of rootlets per rooted cutting was also substantially higher in April-collected cuttings than in the others; but the relationship, if any, between rootlet numbers and IBA concentration was not clear. Also, there was no clear difference between juvenile and mature stem cuttings (table 2).

Almost all the stems collected in June died. The September stems did fairly well—38 to 65 percent rooting among cuttings treated with IBA. But rooting locations, number of rootlets, and propagation costs were all less favorable than those for the April collections (tables 1 and 2).

In the rhizome cuttings, those with sprouts had about double the rooting percentage and a propagation cost that was 15 percent higher than that of rhizomes without sprouts. The extra cost (table 1) was well justified. The season of collection was less important than the presence of sprouts, but the rhizomes-with-sprouts collected in May were the best overall. Their rooting percentage (74) was lower than that of the October collection, but the May collection produced 3.7 times more rootlets per rooted cutting than the October collection (table 3).

Cat Greenbrier.—None of the stem cuttings rooted well enough to be of practical interest: 95 percent of the cuttings died within 6 months, and no treatment gave more than 10 percent rooting.

The rhizomes rooted better than the stems, and rhizomes-with-sprouts collected in May were the most promising—31 percent rooted. Similar rhizomes collected in October showed about the same rooting, 26 percent, but had substantially fewer rootlets per cutting. As in common greenbrier, the rhizomes with sprouts cost more to collect but produced rooted cuttings much more economically than did rhizomes without sprouts (tables 1 and 3).

Tubers collected in May rooted best—69 percent—and the rooting was vigorous. Tubers collected in September and planted while fresh all survived and half of them rooted, but they produced few rootlets. Cold storing the fall-collected tubers for 3 months before planting apparently restored rooting vigor to about the same level as in the May collection, but reduced the rooting percentage. Clearly, the May-collection tubers were the most economical of all cat greenbrier propagation sources (tables 1 and 3).

Discussion

Our results favor common greenbrier over cat greenbrier and suggest at least three options in propagating both species: (1) start in the greenhouse in spring, (2) in the greenhouse in fall, or (3) outdoors in the spring.

1. High rooting percentages and vigor favor starting in the greenhouse in spring using either:

- Common greenbrier rhizomes-with-sprouts collected in May.
- Common greenbrier stems collected in April.
- Cat greenbrier tubers collected in May.

The disadvantage in a spring start is that the stock should be held in the greenhouse nearly a full year before transplanting.

2. Fall-started cuttings probably can be transplanted in the following spring, particularly if they are hardened-off before transplanting. We did not test this thoroughly, but it was successful in a few trials that did not include a hardening-off period before planting. Although this option requires less time in the greenhouse, it would require more stock and bench space. Rooting percentages and vigor were generally lower in our fall-collected cuttings than in our spring collections.

3. Starting the cuttings outdoors in the spring may be more effective than a start in the greenhouse in the fall. We did not test this alternative, but the spring-collected cuttings and tubers seem adaptable to rooting outdoors if they are adequately watered and protected from heat. This option may allow more flexibility in selecting the outplanting time, and rooting percentages over the course of a full year might be higher than those we observed at 6 months after planting.

Because stem cuttings from the youngest growth rooted about the same as those from older growth, many cuttings can be taken from a single stem. Similarly, one rhizome can provide many cuttings. Length of a cutting should be about 6 inches or less as needed to include at least three nodes with live buds. Because greenbriers root mainly at nodes that are underground, planting should be done so that one to three nodes on stem cuttings, and three or more nodes on rhizomes, are buried in the rooting medium.

For those parts of rhizome sprouts that will stand above the medium, we suggest retaining enough to bear two leaves but clipping beyond those leaves. This will remove upper nodes that might form lateral sprouts and contribute to excessive transpiration, even under intermittent mist (*Edward S. Elliott, personal communication*).

Among stem cuttings collected in April, rooting percentages increased as IBA concentration increased from 0.1 to 0.8 percent. The September collection showed a similar pattern except in one sample that seemed aberrant—juvenile stems at 0.1 percent IBA (table 2). This indicated that the optimum concentration was at least 0.8 percent and that higher concentrations should be tried. Auxin at higher concentrations may retard shoot development (*Hartmann and Kester 1968*) and benefit root formation through maintaining carbohydrate reserves in the cuttings.

Other variables that we have not tested but that seem promising are: selection of cuttings from greenbrier clones that root easily (*James L. McConnell, personal communication*); layering in the field (*Hoy C. Grigsby and Robert C. Hare, personal communications*); and use of slat-bottom beds and bottom heat (78 to 80 F) in the greenhouse (*Grigsby, personal communication*).

References

Bailey, R. W., and K. T. Rinell.
1968. History and management of the wild turkey in West Virginia. W. Va. Dep. Nat. Resour. Div. Game and Fish. Bull. 6. 59 p.

Ball, Victor (Ed.).
1972. The ball red book. George J. Ball, Inc., W. Chicago, Ill. 12th ed., pp. 149-153.

Bartok, John W., Jr.
1971. Comparative costs of greenhouse construction. Conn. Greenhouse Newsletter 43:1-3.

Blair, W. Frank.
1936. The Florida marsh rabbit. J. Mammal. 17:197-207.

Everett, T. H. (Ed.).
1967. New illustrated encyclopedia of gardening: 2118. Greystone Press, New York.

Gilfillan, M. C., and H. Bezdek.
1944. Winter foods of the ruffed grouse in Ohio. J. Wildl. Manage. 8:208-210.

Goodrum, Phil D.
1961. Greenbriers. *In* Lowell K. Halls and Thomas H. Ripley, eds. Deer browse plants of southern forests: 62-67. USDA Forest Serv. S. and SE. Forest Exp. Sta. 78 p.

Halls, Lowell K., and Rene Alcaniz.
1965. Rooting cuttings of browse plants. USDA Forest Serv. Res. Note SO-25. 2 p.

Hartmann, Hudson T., and Dale E. Kester.
1968. Plant propagation: principles and practices. Prentice-Hall, Englewood Cliffs, N. J. 2nd ed., 249-251, 261-266, 305.

McAtee, W. L.
1936. Groups of plants valuable for wildlife utilization and erosion control. USDA Circ. 412, 11 p.

Marshall, McNeil, Franklin D. Schales, and P. H. Massey, Jr.
1966. A gothic greenhouse for town and country homes. Va. Polytech. Inst. Coop. Ext. Serv. Circ. 892 (rev.), 11 p., pattern.

Martin, A. C., H. S. Zim, and A. L. Nelson.
1951. American wildlife and plants—a guide to food habits. McGraw-Hill Book Co., New York. 500 p.

Nelson, A. L., T. E. Clarke, and W. W. Bailey.
1938. Early winter food of ruffed grouse on the George Washington National Forest. USDA Circ. 504, 37 p.

Sheat, Wilfrid G.
1953. Propagation of trees, shrubs and conifers: 361. MacMillan and Co., London.

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